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EVOLUTION IN AGRIBUSINESS “VALUATION” WITH ESG PRACTICES, CATALYZED BY DIGITAL TRANSFORMATION

Hamilton Caio Gouvêa[1]; Gisela Consolmagno Pelegrini[2]

[1] Autor. Engineer. MBA Digital Business. Piracicaba, São Paulo, Brasil
[2] Advisor. Pecege MBA USP/ESALQ. University Professor. Piracicaba, São Paulo, Brasil

ABSTRACT

Agribusiness companies are part of the longest supply chain in the national economy, from the field to the customer's table. Starting from commodities, the products can cost to consumer 20 or 40 times more when compared to the basic raw material, at the beginning of the chain. In this value aggregation process, industries have achieved greater Valuation through investment in attributes such as food quality, taste, health and well-being provided by products. Although consulting firms and the United Nations Organization [UN] have stated for decades that significant added value will come from Environment, Sustainability and Governance [ESG] practices, there are controversies and barriers in Brazilian agribusiness. We carried out a documentary analysis of secondary data, for the systematic mapping of correlations between ESG - Digital - Valuation, using secondary data, to confirm trends in the evolution of the value of companies, indicating the importance of positive socioenvironmental actions accelerated by digital. We research and map scientific works through Google Scholar. We compared primary data of Valuation using platform Yahoo Finance; along with ESG Risk data from Sustainalytics platform. Then we draw the Corporate Socioenvironmental Innovation Matrix, Stakeholders ESG Value versus Shareholder Enterprise Value, showing gaps between Brazilian companies and similar internationals, identifying paths of improve asset value in agribusiness chain. The work suggests an emerging profile of companies, with a Valuation beyond 25x EBITDA, which shall reach the apex of agribusiness chain by 2030, probably to be called AgriTech 6.0.

Keywords: *Value; Sustainability; Agroindustry; Social Risk; Communication*

1. INTRODUCTION

From 1980 onwards, Brazil underwent privatization and economic opening, which made the term "Valuation" important as companies needed to generate value to attract investments and justify their existence. This reality brought new requirements, demanding that the calculated value be reliable, reproducible and financially clear.

This is how “Valuation” methods emerge, important for determining fair value through revenue, profits, cash flow and cost of capital. Once the value of the company is determined, it becomes possible to continue increasing it through acquisitions, strategy or even the sale of the company. The methods help investors assess whether there is under or overvaluation, which is essential before allocating capital (Assaf, 2012). After globalization, in the late 90s, the era of digital transformation began, with new ways of carrying out old businesses, disruptive models emerging, connecting individuals online, via the internet, with full access to information via platforms and cloud storage (Castells, 1996).

This transformation of the economy and society, which continues to accelerate, is correlated with five innovations: Internet, Smartphones, Social Networks, Big Data and Artificial Intelligence. The impact of these innovations, on society, companies, work, quickly led to fundamental issues such as inequality, poverty eradication, income distribution and sustained development (Brynjolfsson and McAfee, 2014). As a result, the 17 UN Guidelines for Sustainable Development [DDS] emerged in September 2015, at the summit in New York, adopted by the 193 Member States with a deadline for implementation by 2030 (United Nations, 2015).

The internet also brought new dynamics to the capital market and accelerated the diversification of investment funds. In 2017, Bovespa became [B]3, connecting the entire Brazilian market. Startups, innovation hubs, “Venture Capital” and “Private Equity” funds emerged, popularizing applications and the giant success of Bill Gates and Steve Jobs inspire the dream of building unicorns (companies worth more than US$1 billion) from of a garage.

Growth has become exponential with the arrival of digital platforms whose value increases in the square of the number of users. (Ismail, 2014). Apple, Amazon, Ubber, Airbnb and SpaceX are successful unicorns, and many others continue to emerge (Ries, 2011; Thiel, 2014; Sullivan, 2009; Fripp, 2018; Mendocha, 2016; Osterwalder, 2015).

Post-pandemic, Blackstone, the largest “Private Equity” fund, with US$649 billion in assets, emphasized the importance of ESG, declaring that investors should stop pretending that climate problems have no financial impact (Fink, 2022) . ESG becomes the unavoidable path to long-term value and investor confidence.

This socio-environmental awareness, along with digital, has grown dramatically. However, it is necessary to contextualize that political involvement around sustainability has risen to a higher level due to its connection with the survival of humanity and the planet.

The Eco-92 Conference, or Rio-92, marked the 1st UN meeting on environment and development. The Conference had scientific, diplomatic, political and environmental consequences, initiating debates that resulted in the 17 UN DDS, 23 years later.

In politics, Jimmy Carter, president of the USA in 1977, was a pioneer in warning about the limits of economic growth in rich countries to the detriment of social equity. Another highlight was French President François Mitterrand, who in 1981 questioned growth at any price and promoted policies to reduce dependence on fossil fuels. The digital transformation brought greater awareness of socio-environmental challenges and the movement gained significant reinforcement with the book by US Vice President Al Gore, "The Inconvenient Truth" (2006), which cemented the climate agenda at the center of the political debate. Leaders such as Angela Merkel, Chancellor of Germany, and Justin Trudeau, Prime Minister of Canada, demonstrated a strong commitment to environmental issues, promoting policies to reduce emissions and encourage renewable energy.

There is no way to ignore that ESG is the main topic on the agenda of most companies (McKinsey, 2020; KPMG, 2021). However, experts argue that ESG is the State's task and holding companies accountable results from the government not carrying out its regulatory role (Cornell and Shapiro, 2020; Damodaram, 2022).

However, 45 years have passed since Jimmy Carter and indicators of the 17 UN DSDs are getting worse. In the eyes of the restless new generations, poorly informed about the possible harm of agribusiness in secondary and elementary school teaching material (FIA-USP, 2022), companies end up rejected by 33% of the population in the country itself (ABMRA, 2022).

In this context, we see ESG not as charity, “compliance” or risk reduction, but as an innovative solution to socio-environmental problems and long-term business value. This work points out ways to generate value through positive socio-environmental impact, which can give a new meaning to agribusiness, catalyzed by digital transformation.

Having indicated the logical paths to achieve an expressive “Valuation”, it will be necessary to simultaneously start a new cycle in agribusiness, this time that of communication, as stated by the president of ABMRA Ricardo Nicodemus (2022). The secret to more value in business lies in the marriage between numbers and narrative (Damodaram, 2017).

2. METHODS

Although there is a lot of material claiming that companies will find value through ESG, it is not clear whether this is true in practice. Shareholders and financial analysts question this principle and pejorative themes such as “greenwashing” and green CEOs emerge. This work aims to identify and synthesize quantitative evidence of the connection between ESG and business value.

Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
WhatsApp: +55-11-972671139. E-mail: caio@agro-valor.com.

The research combined documentary analysis of secondary data and the systematic mapping of correlations between “ESG-Digital-Valuation”, to determine trends in the evolution of companies’ value.
Systematic mapping through Google Scholar, around the key words: “agribusiness”, “valuation”, ESG, “practices”, “digital” and “Ebitda”, between 2017 and 2023, identified 97 articles, which were the point of departure from work.
Document analysis was carried out to understand the methodologies for calculating “Valuation”, financial value and ESG risk in the links of inputs, agriculture, ingredients, food and agribusiness distribution.
Given the great controversy surrounding ESG, we gathered more comprehensive articles, prepared with statistical significance, and focused the analysis on possible paths.
3 systematic mappings were carried out around the following questions:
• Is there a positive correlation between ESG and Average Cost of Capital?
• Are ESG practices essential in the Digital era of intangible assets?
• Does ESG reduce companies' long-term financial risk?
The articles from the 3 mappings substantiated the correlation between “ESG-Digital-Valuation”.
As the reputation of Brazilian companies is an additional challenge compared to international counterparts, the negative effect of location in Brazil was also the subject of the work.
Primary data on “Valuation” and ESG risk were compared for various agribusiness sectors and against the market, from international versus Brazilian leaders and the market.
We identify the main technologies and examples of innovation in agribusiness based on digital transformation.
The Corporate Socio-Environmental Innovation Matrix (ISC) was built, based on ESG Value for stakeholders versus Financial Value for investors and shareholders, mapping the market reality, to show the gaps between the Brazilian scenario and similar multinationals, indicating the paths to asset appreciation.

3. RESULTS AND DISCUSSION

Initially, methodologies for calculating the Valuation, its various applications, reference values and the key factors of value generation were analyzed. From this understanding, references of the behavior of value in the links that make up the agribusiness chain were sought.

3.1 The Methodologies for Calculating Valuation

Seven methods of calculating Valuation were identified as shown in Figure 1, the most complete being the Discounted Free Cash Flow (DFCF) at present value (#1) and the most common the Valuation by Multiples (#2) or Compared Transactions (#3).
The multiples approach is a relative valuation method that uses financial indicators of similar companies. Corporate Value multiples (EV/EBITDA or EV/Revenue) and Equity multiples are the common forms of valuation. Multiples of stocks used are "Price/ Earning, Price/ Book, and Price/ Sales". The Multiples approach is fast, but for accuracy it must be well segmented (sector, size, profitability, portfolio) and used in a complementary way with the DFCF of method 1. Another great advantage of multiples is that they allow comparison with transactions already carried out, which are an excellent basis for Valuation processes (Damodaran, 2007).

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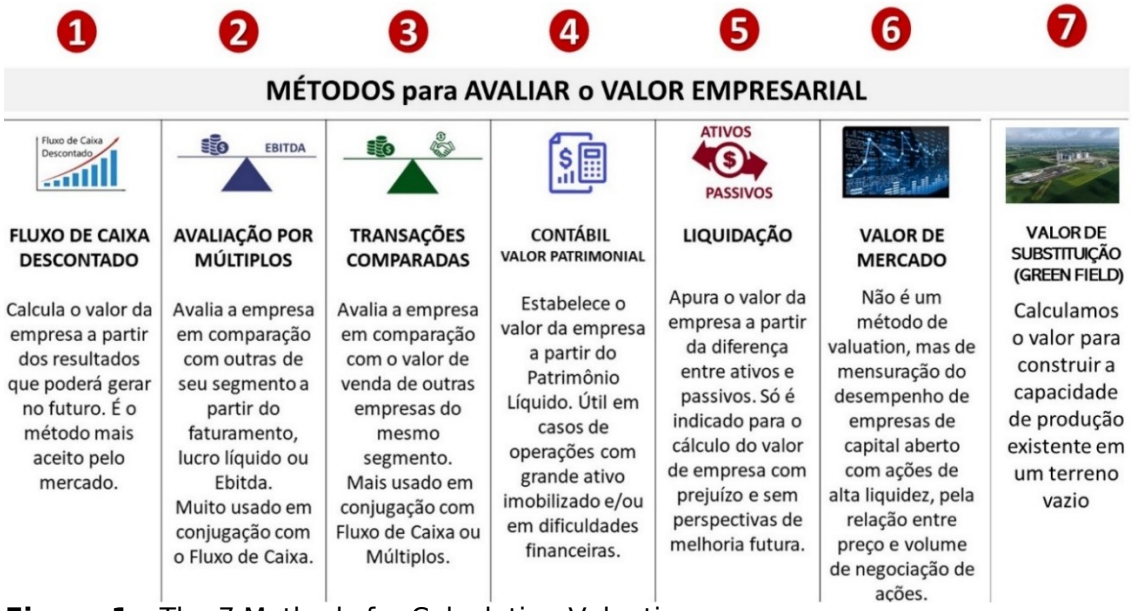
WhatsApp: +55-11-972671139. E-mail: caio@agro-valor.com.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MÉTODOS para AVALIAR o VALOR EMPRESARIAL
Fluxo de Caixa Descontado
EBITDA
ATIVOS
PASSIVOS
FLUXO DE CAIXA DESCONTADO
Calcula o valor da empresa a partir dos resultados que poderá gerar no futuro. É o método mais aceito pelo mercado.
AVALIAÇÃO POR MÚLTIPLOS
Avalia a empresa em comparação com outras de seu segmento a partir do faturamento, lucro líquido ou Ebitda. Muito usado em conjugação com o Fluxo de Caixa.
TRANSAÇÕES COMPARADAS
Avalia a empresa em comparação com o valor de venda de outras empresas do mesmo segmento. Mais usado em conjugação com Fluxo de Caixa ou Múltiplos.
CONTÁBIL VALOR PATRIMONIAL
Estabelece o valor da empresa a partir do Patrimônio Líquido. Útil em casos de operações com grande ativo imobilizado e/ou em dificuldades financeiras.
LIQUIDAÇÃO
Apura o valor da empresa a partir da diferença entre ativos e passivos. Só é indicado para o cálculo do valor de empresa com prejuízo e sem perspectivas de melhoria futura.
VALOR DE MERCADO
Não é um método de valuation, mas de mensuração do desempenho de empresas de capital aberto com ações de alta liquidez, pela relação entre preço e volume de negociação de ações.
VALOR DE SUBSTITUIÇÃO (GREEN FIELD)
Calculamos o valor para construir a capacidade de produção existente em um terreno vazio

Figure 1 – The 7 Methods for Calculating Valuation.
Source: Assaf (2012); Copeland (2007); Damodaran (2007)

In method #1, the Average Cost of Capital Employed, discounts the company's entire cash flow at present value, being an extremely important parameter.
Every risk classification methodology, financial or ESG, presupposes obtaining a lower cost of capital from the lowest risk. Thus, the 1st systematic mapping of the correlation between "Valuation" and ESG was carried out to answer whether "does the cost of capital decrease with ESG practices?", leading to 5 main articles:

1. Kim T., Kim K. (2019) reviewed 61 studies on corporate socio-environmental performance and cost of capital, indicating a positive relationship between both.
2. Naismith et al. (2020) reviewed 44 studies and in most of them ESG is positively related to the lowest cost of capital.
3. A study involving 12,915 companies from 23 countries by Ghoul et al. (2011) shows the lowest cost of capital with best ESG practices.
4. The study of the statistical correlation between ESG and cost of capital, carried out in the Thomson Reuters Eikon database, involving 6,393 American companies, indicates a positive correlation between 2016 and 2020, with 5% significance (Agnieska, P. et al., 2021).
5. The MSCI report, based on the 8,500 companies it tracks, presents evidence that with better ESG performance there is a lower cost of capital (MSCI, 2019).

The references point in the same direction and the 1st systematic mapping, which covers 108 studies and 27,000 companies, indicates that ESG practices generate a lower cost of capital.

3.2 The Reality of Intangible Assets

The Book Value and the Asset Settlement Value (#4 and #5 in the figure above) are the traditional methods that assign Value according to the Balance Sheet. The net value of the company is calculated as Total Assets minus Total Liabilities. These methods are more conservative due to the book depreciation of assets and the lack of consideration of market values for intangible assets (Patent, Intellectual Property and Trademarks). In the digital age, intangible assets have become the determinants of the value of companies.
Digital platforms have revolutionized the structure of companies, as we can see by analyzing the nature of the assets in the Standard & Poor's 500 stock portfolio, which defines the market in the US, over the last 45 years. If in 1975 the assets were 83% tangible (machinery, equipment, real estate) in 2020 the intangible aspects are 90% and are not recorded in the companies' balance sheet (patents, human capital, intellectual property, trademarks, customer relations, data).

Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
WhatsApp: +55-11-972671139. E-mail: caio@agro-valor.com.

As indicated in Figure 2, the top 5 companies in 1975 were IBM, Procter & Gamble, Exxon Mobil, 3M, GE and in 2020 we have the big 5 "Big Techs": Apple, Microsoft, Meta, Amazon and Google. The total value of revenue for the 500 S&P 500 companies rose from $715 billion to $33.7 trillion, a 9% year-over-year growth.
However, throughout 2022, "Big Techs" lost US$ 4 trillion in market value (Morningstar, 2022), equivalent to Germany's GDP, raising suspicions that a new bubble was on the way, like the real estate bubble in 2008 in the USA. Thus, many have reservations about this growth in the value of companies based only on intangible assets. This mistrust, added to the socio-environmental challenges we face, reinforce the intensification of the focus on ESG in the capital market.

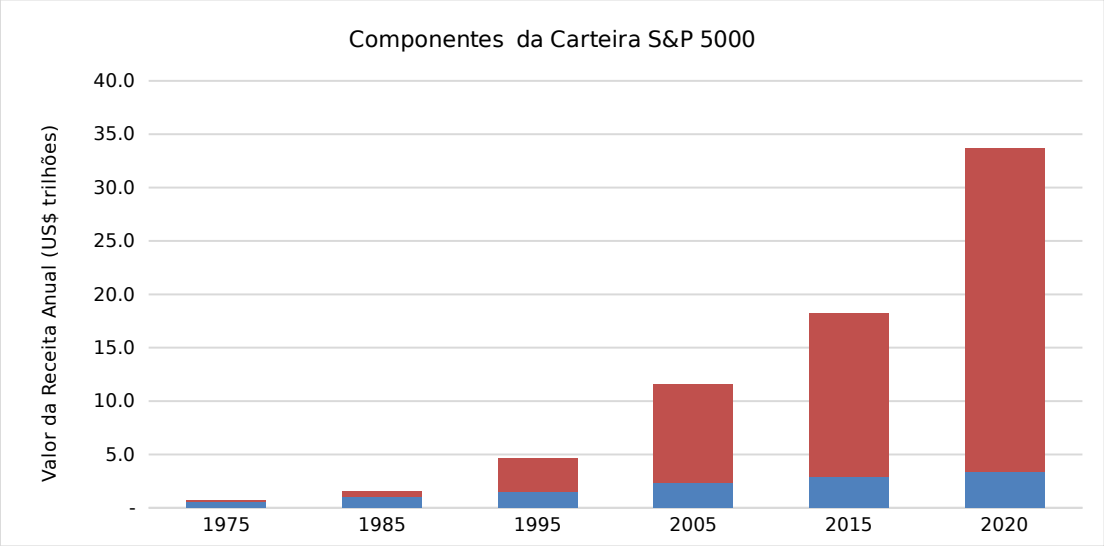

Figure 2 - The Evolution of Intangible Assets in the S&P500 Portfolio.
Sources: Ocean (2020); Yahoo Finance

In the 2nd systematic mapping, we found criticism of ESG for not delivering immediate results (Demers et al. 2021), countered by other studies (Zumente and Bistrova, 2021). The controversy over whether ESG is the solution to grow the value of companies with a high level of intangible assets is great and we will not solve it in this work. But as in Brazilian agribusiness it is impossible to disregard the ESG agenda, intangible assets are a path to more value. In addition, Camodeca and Almici (2021) show the positive correlation between digital transformation and the 17 UN DDS, highlighting the digital lever in the implementation of a sustainability agenda. Thus, it seems to us a simplistic immediacy to deal with value only from a financial point of view, without considering indicators of social equity and biodiversity in the analyses. That is why at the end of the work the ISC Matrix was created.
The recent crisis of Silicon Valley and Credit Suisse Banks, triggered at the beginning of the year, will reignite discussions, first on Governance and Risk (Danielsson and Goodhart, 2023) and then probably on the focus on long-term ESG Projects to reduce risks.
Zumente and Bistrova (2021), evaluating 2,200 business reports, found that a high standard in ESG is linked to better financial performance in the long term, suggesting that the connection with ESG objectives can guarantee lower risk in investments.
A similar article reviews the relationship between sustainability and financial performance, based on integrated reports, showing that the connection with long-term ESG objectives can be a guarantee of lower risk in investments (Lodhia, 2017).
Another reference argues that companies that adopt sustainability practices and consider stakeholder concerns may have better financial performance in the long run (Clark, 2015).
The 2nd systematic mapping showed that the adoption of ESG projects points to the reduction of business risk in the long term. The recent problems of investments in startups, venture capital and emerging models (Silicon Valley Bank and Credit

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Suisse), strengthen the rigor in valuation, materialities and better systems for ESG risk assessment.

3.3 The Opportunity of Unicorns in Agribusiness

On the other hand, it cannot be ignored that technology companies have revolutionized the market by becoming Unicorns with few tangible assets: UBER has become the world leader in taxis, but it does not have cars; AIRBNB accommodation without real estate; AMAZON has no stocks, FACEBOOK does not write articles, INSTAGRAN does not do photographs and NETFLIX does not have TV or cables.

Companies with a large value of intangible assets depend on market perception, are more susceptible to controversy, and may prefer to delve deeper into ESG practices to improve their reputation and brand value. Leveraging intellectual property and trademarks, companies such as UPS, Barclays, Campbell, Patagonia, Saleforce, and Apple have successfully invested in ESG to enhance reputation, strengthen brand, reduce risk of negative stakeholder perceptions, and increase competitive advantage (Kiser, 2018).

As we will see later, a high-value sector is ingredient industries such as Givaudan, whose main shareholder has been Bill Gates for more than 15 years. To complement the portfolio of intangible businesses, investors avoid controversy by looking for low-risk ESG "Agro Techs", such as Givaudan.

We then analyze Brazilian companies in the pulp and paper sector, Klabin and Suzano, both operating in a sector full of controversy and usually associated with deforestation, the pulp and paper sector. However, due to the recognized preservation and sustainability policies, they received an excellent low ESG risk rating, surpassing competitors and the world leader International Paper.

We analyzed the main pulp and paper companies, to highlight Klabin, both in low risk (12 compared to the average of 18) and in high valuation (18x EBITDA compared to the average of 7x).

Suzano is also highlighted with low ESG risk, in line with the average of the best and occupying the 12th position in a list of 76 sectoral companies.

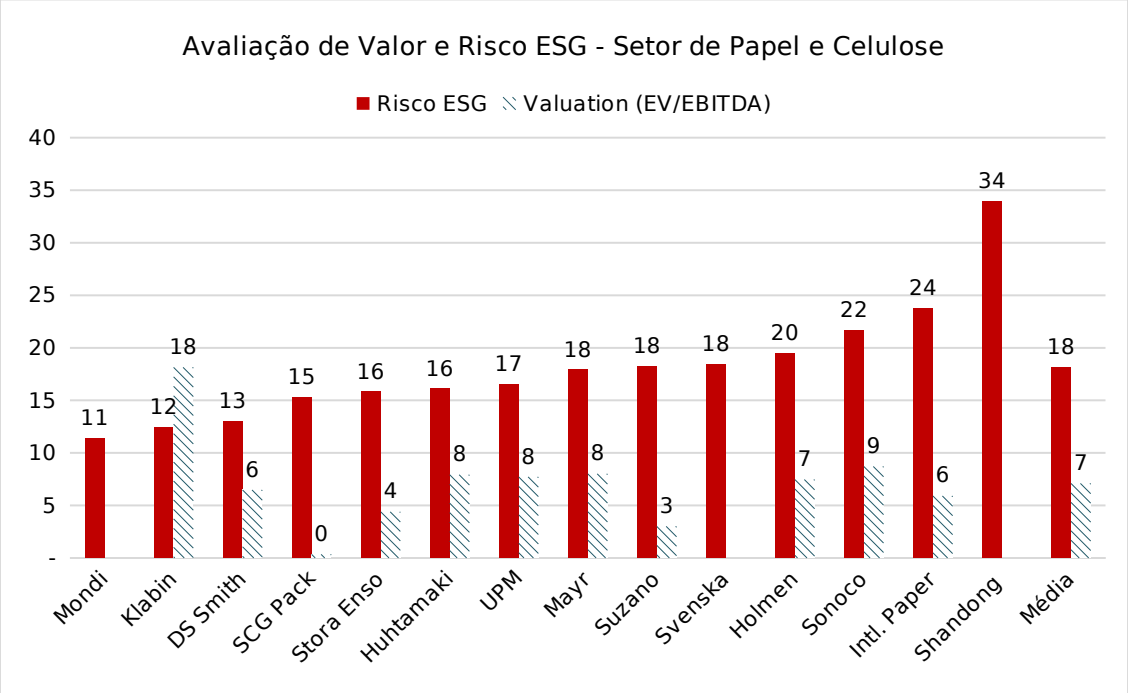

Figure 3 – Prominent ESG companies *versus* "Valuation" in the Pulp and Paper sector

Source: Sustainalytics; Yahoo Finanças

Agribusiness has sectors with high environmental risk, such as cattle ranching, which is strongly associated with deforestation (McFarland, 2015). The ESG risk of JBS and Marfrig is severe (49 and 41) according to Sustainalytics. One of the solutions for better sustainability of livestock is the Agroforestry Systems (SAF) and

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associations with confirmed forest management companies, such as Klabin and Suzano, can generate significant worldwide recognition.
The main neuralgic regions for Brazilian livestock have also been the focus of study for the implementation of AFS in the last 35 years by Embrapa (2009). But since the benchmark of crop-livestock-forest integration (Balbino, 2011), little result of global relevance has been presented. Professors Sene and Bacha (2024) show that the adoption of AFS may have an application limit, being feasible up to a certain number of head per hectare. Criticism and controversies around deforestation, an obstacle to cattle ranching, recommend research on synergies with SAF, due to the potential value for Brazil.

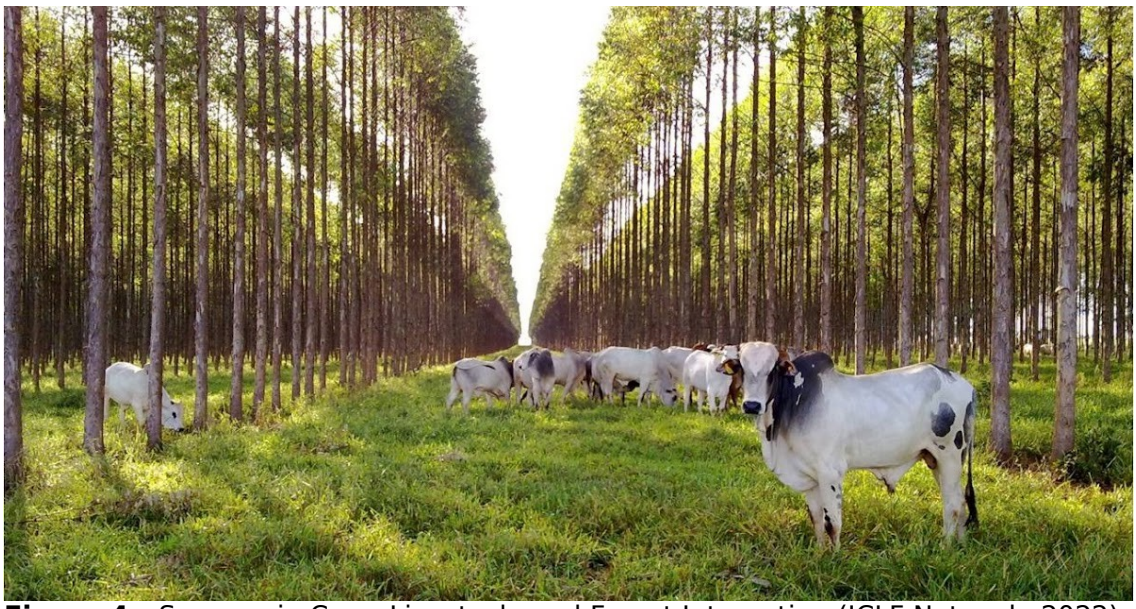

Figure 4 – Synergy in Crop, Livestock, and Forest Integration (ICLF Network, 2022)

The 3rd Systematic Mapping of the relationship between ESG and Intangible Assets was carried out, answering whether "should intangible asset companies adopt ESG practices?".

1. KPMG (2020) showed that companies with a high value of intangible assets face significant risks related to ESG issues, such as climate change, data security, and corporate governance. The study emphasizes the importance of managing these risks through the adoption of robust and effective ESG practices.
2. Research by Harvard Law School (2016) concluded that companies with high market value, such as those with intangible assets, are more subject to pressures for better practices. The study highlights the importance of investors and regulators being aware of ESG, putting pressure on companies to act responsibly and sustainably.
3. The PwC study (2019) emphasizes that companies with a high value of intangible assets need to focus on ESG issues to preserve and increase their brand value and reputation. The survey highlights consumers and investors who are increasingly aware of ESG issues and expect companies to act responsibly and sustainably.
4. Morgan Stanley research (2015) shows that companies with strong ESG leadership tend to outperform those with weaker practices. This is relevant for companies with intangible assets, as their valuation is often based on non-financial factors, such as the quality of their brand and reputation. The study shows that companies with ESG leadership are more likely to be well-regarded by investors, which can lead to an increase in share price and a lower cost of capital.
5. The study conducted by Eccles et al. (2013) found that companies with high performance on ESG issues are more likely to have a sustainable competitive advantage and be evaluated positively by investors. This competitive

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advantage can be particularly important for companies with intangible assets, which rely on market perception and brand reputation.

6. Research conducted by Harvard Business School (2011) shows that companies that adopt consistent ESG practices tend to have better financial performance in the long run. This outcome is particularly important for companies with intangible assets, as their value is often based on future expectations of financial performance. Additionally, companies with a strong performance on ESG issues may be more likely to attract investors and customers who value sustainability and corporate social responsibility.

This 3rd systematic mapping showed that renowned institutions agree on the advantage of ESG practices in modern intangible asset companies, as a way to attract investors while developing an unblemished reputation.

3.4 The Value Paradigm in the Agribusiness Chain

The specialist Damodaram (2022) provides several valuation comparisons online, in an extensive database involving thousands of companies.

Figure 5 shows the evolution of value along different links in the agribusiness chain, based on 2,600 companies. The highest business values are found in the high-tech sectors (Biotechnology with a Valuation of 46.6x EBITDA and E-commerce 41.7x), followed by indulgence (Alcoholic Beverages 34.2x), the agribusiness link with the consumer (Restaurants 28.7x) and health (Pharma 21.2x). Next, we have closer values, among other links of agribusiness.

Among the ingredient industries there is a Value Paradigm (Duff & Phelps, 2018): the higher the added value of an ingredient supplier, the higher the company's value multiple. Industries such as IFF, Givaudan, Symrise trade above 19x EBITDA, compared to Commodity Based Ingredients with a value of 8.6x.

Another finding about Value-Added Ingredients, as shown in Figure 6, is that their value has been higher than the Standard & Poor's 500 [S&P500] portfolio, while Commodity-Based Ingredients are below the market. It is no coincidence that Bill Gates is the main shareholder of Givaudan.

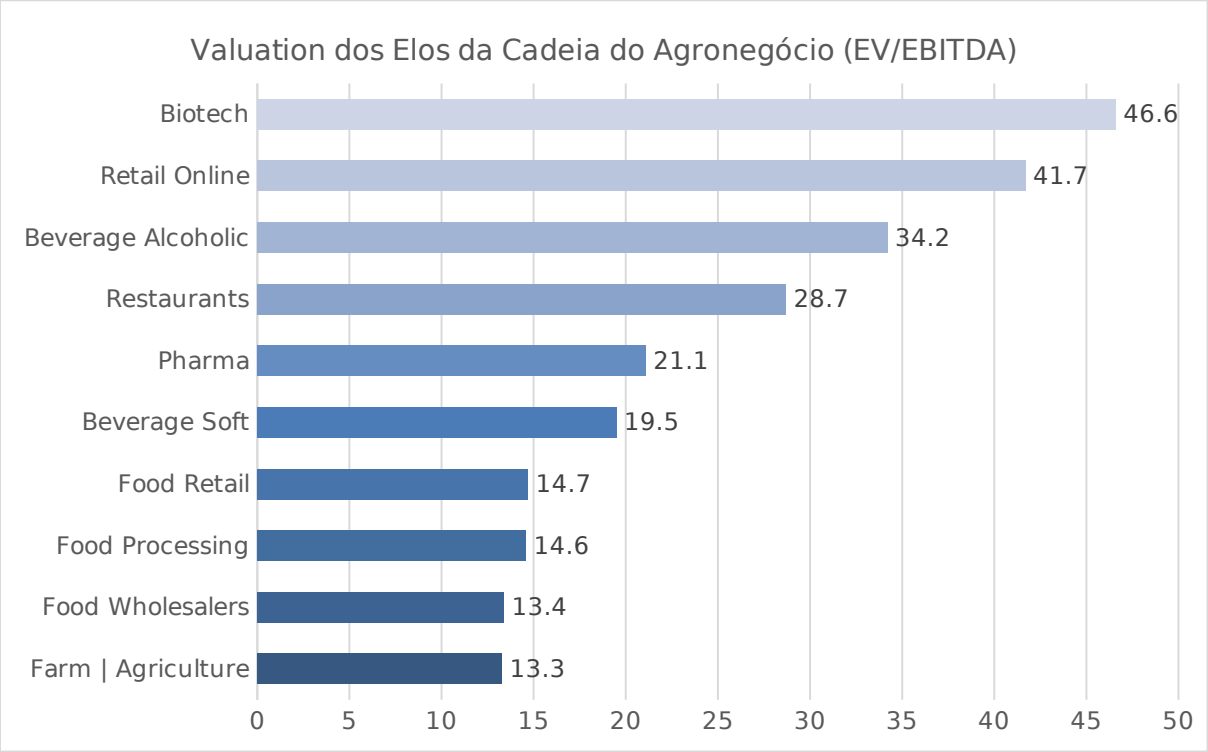

Figure 5 – Evolution of value in Agribusiness links
Source: Damodaran (2022)

Value-added Ingredients industries are characterized by having strong Intellectual Property, Patent value and large Research & Development infrastructure. Those at

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WhatsApp: +55-11-972671139. E-mail: caio@agro-valor.com.

the beginning of the value chain tend to be seen more as suppliers and processors, without intellectual property, and therefore trade at lower multiples.
The value scale in 11 different agribusiness sectors is shown in Figure 7, being lower for the Animal Protein producing industries (9x EBITDA), higher for the health-beneficial food industries (17x EBITDA) and very high for Alcoholic Beverages (26x EBITDA).
The comparison of valuation between sectors allows us to outline several strategies in agribusiness, such as: acquisition of a company in one sector to transform it into another of higher value, (Bakery in Snacks or Protein in Health & Wellness or Dairy), develop value categories by vertically integrating, acquisition in growing sectors or enhance stagnant sectors.
Sector comparisons are useful tools to develop strategies in markets such as Brazil, which has a low rate of industrialization, practically only exporting commodities.

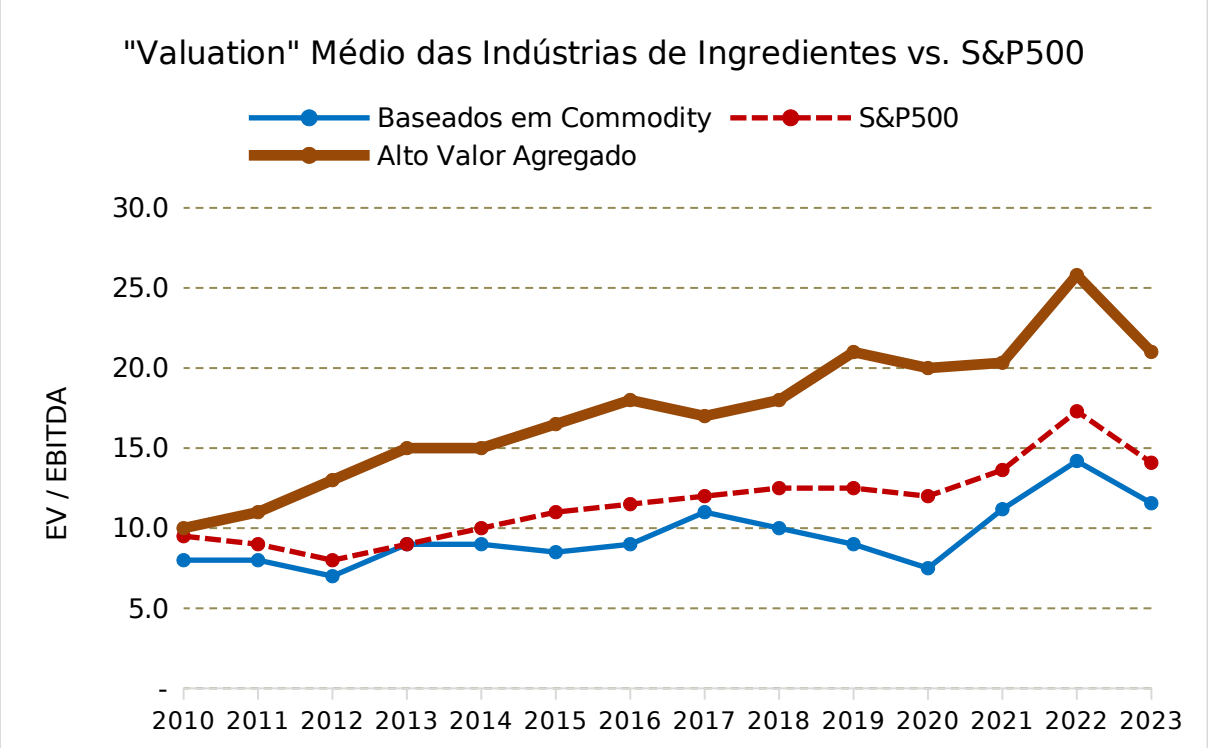

Figure 6 – Comparison of the valuation of food ingredients with the market
Source: Duff & Phelps (2018); Yahoo Finance

Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
WhatsApp: +55-11-972671139. E-mail: caio@agro-valor.com.

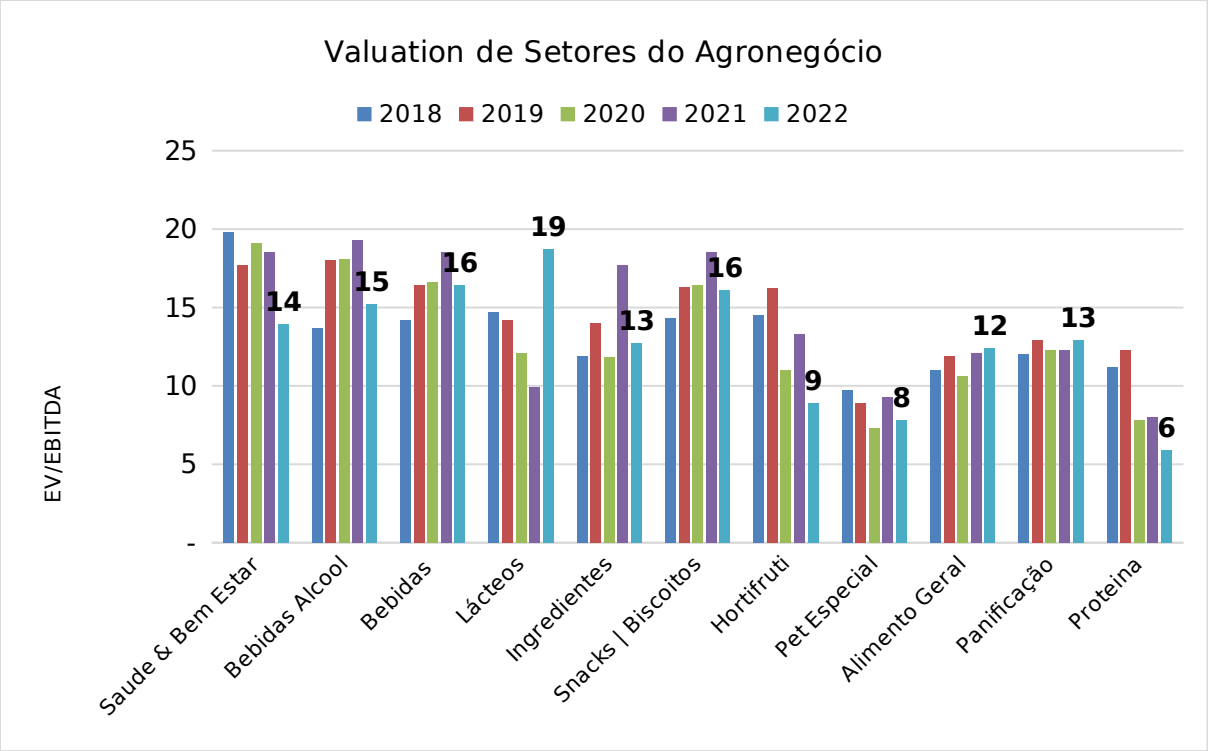

Figure 7 - Evolution of the Valuation of 11 Agribusiness sectors in the last 5 years
Fontes: Duff & Phelps (2018; 2020); Kroll (2022)

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We reinforce that analyses similar to Figures 5, 6 and 7, according to "Design-Driven Innovation" (Verganti, 2012) can redraw the value and meaning of Brazilian agribusiness:

1. by tracing paths for the valorization of business groups;
2. planning strategies to foster innovation, technology and infrastructure necessary to generate an agro-industrial sector that exports value, going beyond commodities; and
3. by connecting investments in ESG technology, to build a new meaning for agribusiness, with reputation and low socio-environmental risk.

3.5 The Challenge of Adding Value in Agribusiness Located in Brazil

In the connected world, the challenges for companies are increasing every day. If at the beginning there is a lack of critical mass to compete in international markets, after overcoming this stage comes the need to conquer the market against companies that have been very well established for decades.

JBS, the largest Brazilian agribusiness company, 2nd after Petrobras, presented in 2022: Revenue of R$ 375 billion and EBITDA of R$ 37 billion. The values are impressive and the result of a well-built acquisition strategy. The company has 75% of sales outside Brazil, leading in the US with a 23% share, ahead of Tyson with 21%.

However, all the debt from acquisitions needs to be paid, compromising dividends and results, which reduces interest on the part of investors. In Figure 8 we can see that JBS's EBITDA is lower than that of the leaders Coca Cola, P&G and J&J, despite rivaling them in Revenue. In addition, JBS USA's ESG risk is 38 (high), while JBS's operation in Brazil has 49 (severe), 10 points higher, carrying the stigma of our meatpackers.

These situations, along with the controversy surrounding the company, confer a valuation of 3x EBITDA while the other companies have 6 to 7 times more value. The direct multiplication by the EBITDA values results in the value for JBS: 14x lower than Coca Cola, 18x lower than P&G and 33x lower than J&J. Although the sectors are different, acquiring devalued assets can be part of the good diversification alternatives.

Among the alternatives for better valuation of JBS, we can highlight:

1. Invest in value-added ingredients (collagen), a recently announced deal, after Darling Ingredients made 2 acquisitions in Brazil: 15 bone powder factories and collagen and gelatin industry in SC. Darling's Valuation is 10x EBITDA.
2. Diversify protein sources, such as fish, with less environmental impact and value to consumers (Huon, salmon industry in Australia).
3. Specialized company with a good reputation, such as Hormel Foods of 16x EBITDA value.

Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
WhatsApp: +55-11-972671139. E-mail: caio@agro-valor.com.

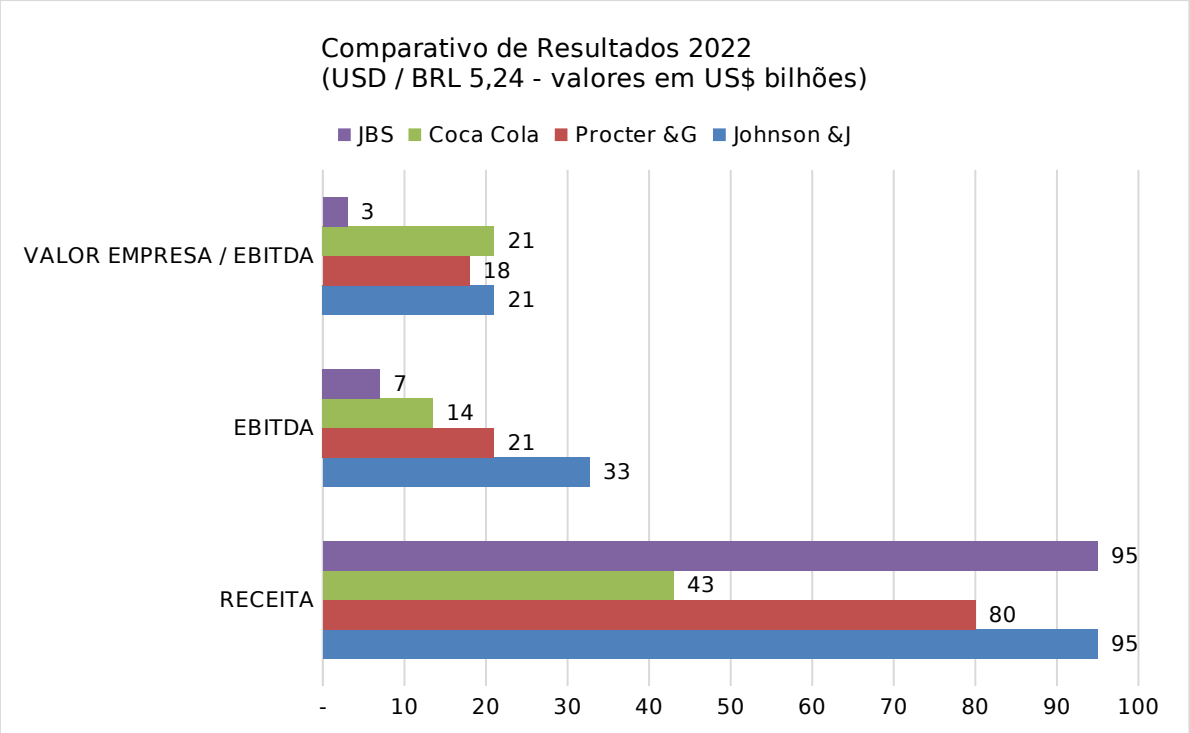

Figure 8 – Comparison **of JBS** with leaders in Consumer Goods
Source: Yahoo Finance

We show in Table 1 how "Valuation" helps to identify paths for business.

1. In proteins, **JBS** may move towards Hormel, a specialized meatpacker with a higher valuation. Although vegetable protein is still a bet without significant results even in the US, Brazil's leadership in soybeans may allow associations.
2. In alcoholic beverages, Ambev's comfortable position, in line with the best sector performance, with sufficient profitability to continue its expansion and diversification.
3. In snacks and cookies, the emergence of **M. Dias Branco**, which due to its revenue can still be the target of consolidation by other companies, but which focuses on exports and healthy products, which generated 30% growth in 2022.

Setor	Empresas	RECEITA (US$ milhão)	LAJIDA (%)	EV / R
Proteina	Tyson Foods (2ª empresa)	52,356	14.9%	
	Hormel Foods (Líder em valor)	12,630	17.0%	
	Beyond Meat (Vegetal)	464	NA	
	Média Setorial EUA (8)	**12,413**	**11.3%**	
	JBS (Lider Mundial)	70,994	8.8%	
Bebidas	Constellation Brands	9,441	17.6%	
Alcoólicas	Brown Forman	4,034	34.9%	
	Molson Coors Beverage	10,578	18.1%	
	Média Setorial EUA (8)	**3,380**	**16.0%**	
	Ambev (Líder Mundial)	15,099	28.0%	
Snacks	Mondelez	29,878	24.10%	
Biscoitos	Hersheys	9,725	26.80%	
	Post Holdings	6,874	13.60%	
	Média Setorial EUA (7)	**12,413**	**11.3%**	
	M.Dias Branco (Líder Brasileira)	1,918.6	8.4%	

Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
WhatsApp: +55-11-972671139. E-mail: caio@agro-valor.com.

Table 1 - Valuation Forecast 2023 for Brazilian and North American Companies
Sources: Yahoo Finance; Kroll (2022)

3.6 The Need for Better ESG Risk Assessment

According to Damodaran (2014), the concept of financial risk assessment classifies companies according to their ability to repay debts and return to shareholders, in short, it evaluates the risk of default. In this way, profit and cash indicators are calculated in multiples of interest, total and long-term debt, to classify companies in risk ranges (Aaa | AAA decreasing to D2 | D) according to Standard & Poor's or Moody's evaluation.

The lower the risk, the higher the valuation, and the better the financial conditions offered, resulting in lower effective interest rates. Thus, the valuation of companies, measured by cash flow discounted at present value, will be higher according to their risk assessment.

Damodaran evaluated the total interest rate for companies in the S&P 500 portfolio, as shown in Figure 9, showing that the cost of capital to cover debt decreases for each positive increment in the financial risk assessment. The companies with the highest risk rating (Aaa | AAA) has an effective rate of 2.9% p.a. while those with the worst evaluation (D2 | D) will have a minimum cost of capital of 14.5%.

To show the impact, we calculated the valuation of 2 hypothetical companies, with R$ 100 million of free cash flow in 5 years, R$ 20 million p.a. The DFCF at present value will be R$ 92 million for the company with AAA risk and R$ 68 million for the company with risk D. Thus, the best risk assessment can generate a 35% higher valuation for companies with AAA rating compared to others with a degree of exposure to risk D.

Rating is S&P/ Moody's	*Default Spread*	*Interest rate on debt*
Aaa/AAA	0.40%	2.90%
Aa2/AA	0.70%	3.20%
A1/A+	0.85%	3.35%
A2/A	1.00%	3.50%
A3/A-	1.30%	3.80%
Baa2/BBB	2.00%	4.50%
Ba1/BB+	3.00%	5.50%
Ba2/BB	4.00%	6.50%
B1/B+	5.50%	8.00%
B2/B	6.50%	9.00%
B3/B-	7.25%	9.75%
Caa/CCC	8.75%	11.25%
Ca2/CC	9.50%	12.00%
C2/C	10.50%	13.00%
D2/D	12.00%	14.50%

Source: bondsonline.com

Figure 9 – Calculation of the interest rate for the financial risk ranges
Source: Damodaran (2012)

What is sought today is to build an ESG risk scale that complements financial risk. However, the concepts are different, from different times and difficult to integrate. Companies were tangible assets in 1975 and intangible assets in 2020; therefore, with different volatilities. ESG is concerned with risk for future generations, while financial risks are concerned with present returns for shareholders. ESG risk evaluators are based on controversies and partial socio-environmental criteria, distorting comparisons between sectors, favoring companies with a "politically correct" discourse.

"Food" has an ESG Risk rating of 3 and "Pulp & Paper" has an ESG Risk of less than 1. Although all 17 UN DDS are important, in Brazil, with 63 million inhabitants with an income below R$500 per month, we need to value and boost the food industry, which works towards less poverty and hunger.

Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
WhatsApp: +55-11-972671139. E-mail: caio@agro-valor.com.

We need consensus and transparency because giant Pulp & Paper projects, such as Klabin (Puma II Paraná Project) and Suzano (Cerrado Project, the world's largest pulp mill in Mato Grosso do Sul, Cerrado Biome) do not seem to be questioned while sectors such as Citrus have been for decades. Clearly, companies in developing countries, in addition to the barriers faced, are still stigmatized compared to those in the same sector located in developed countries. Even in a company like the JBS Group, the ESG risk assessment of the operation in Brazil already carries an additional 10 points compared to that of the US.

In the FAO report – "Global Forest Resources Assessment" (2020), the criticisms are based on inexpressive examples, without considering Brazil's giant contribution to world food and tropical agriculture. The reforestation of the Atlantic Forest via cattle raising in ES, inexpressive in cattle raising; along with the MST's actions defending forests, need to be replaced by plural works by Embrapa, ESALQ and Agricultural Colleges.

The negative impact of ESG risk assessment on Brazilian agribusiness, resulting from the lack of protagonism, consensus, or little sectoral representation with the government, requires other similar work to elucidate and point out paths. Thus, we only identify a value sink that needs to be repaired so that we can have a coherent ESG risk assessment for Brazilian companies.

The need to homogenize and revise the criteria to be truly reliable was detected when comparing the criteria and results of ESG assessment providers: MSCI, Refinitiv, Robeco SAM, Sustainalytics (Billio M. et al., 2020).

The OECD highlights the need to invest in five fronts of improvement in ESG risk assessment: (i) consistency, comparability and quality of metrics; (ii) ensure the relevance of the reporting through financial materiality; (iii) level the playing field for ESG disclosure and ratings between large and small issuers; (iv) transparency and comparability of provider scoring methodologies and established ESG rating indices (v) product labeling and communication (Boffo, 2020).

The World Economic Forum (WEF, 2022) dissects ESG in all possible ramifications on strategic intelligence maps, but it still seems far from transforming reflections into fostering effective socio-environmental practices.

Figure 10 compares Enterprise Value *versus* ESG Risk for Food Distribution, the end of the agribusiness chain. The two companies that generate inclusive development in Africa (**Bidvest**) and Brazil (**Atacadão**), saviors of multinationals from bankruptcy, have the worst evaluations, hardly being preferred by investors over traditional giants.

What good is the WEF if its work does not benefit the few good examples in emerging markets? The WEF seems to be a forum for reflection of developed countries, following its consecrated models, which led us to the reigning chaos.

Faced with the need for consensus on the paths of agribusiness, through ESG and financial value, we evolved the graph in Figure 10 for the ISC Matrices, creating new maps to lead to different destinations.

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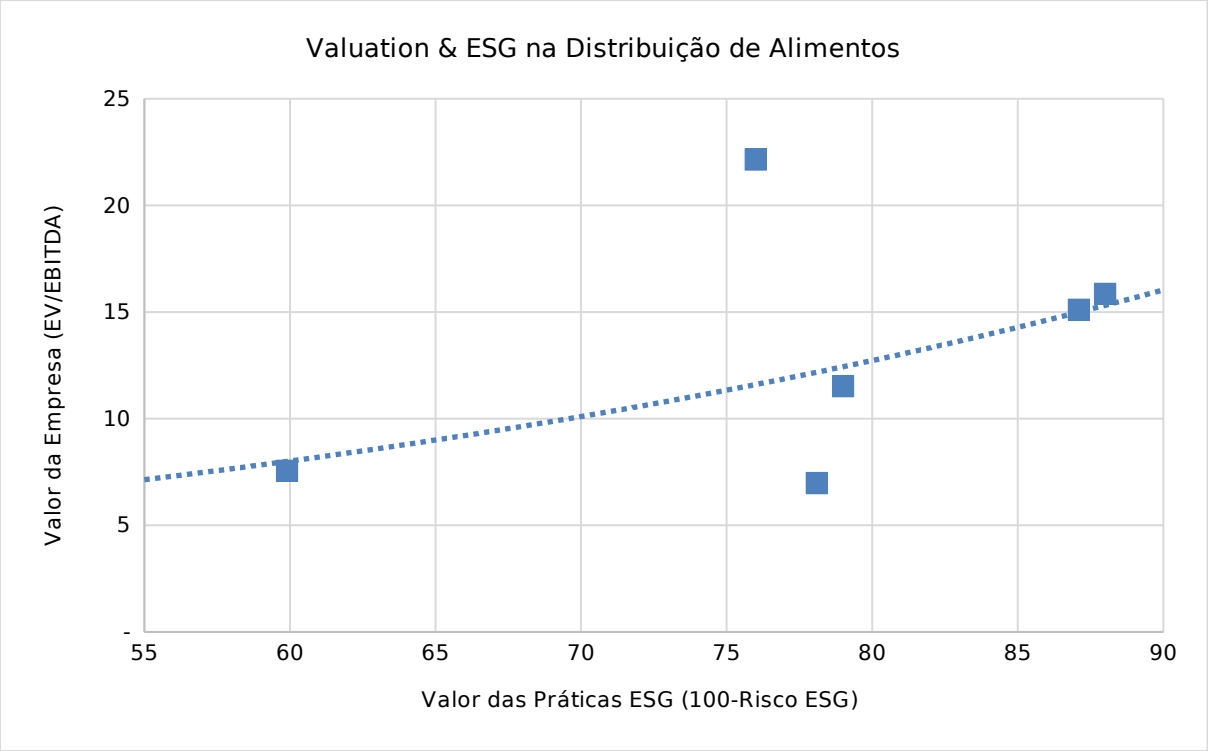

Figure 10 – ESG Risk and Valuation in Food Distribution in Emerging Markets
Sources: Yahoo Finance; Sustainalytics

3.7 Top 10 Agribusiness Innovations Leveraged in Digital Transformation

1. Precision agriculture: the use of drones, sensors, and GPS systems to more accurately monitor and manage the use of fertilizers, water, and pesticides (Ruiz et al., 2018). We recommend the **Guaspari Winery**, an award-winning success for its high-quality wine, thanks to precision irrigation technology, along with others such as pruning and flowering planning, by Embrapa, on the border of the State of São Paulo with Minas Gerais, an old coffee region with a climate different from that recommended for harvesting (Embrapa, 2018).
2. Integrated pest management: the use of software and applications that collect data on the presence of pests and assist in integrated management, with techniques that involve the use of natural and biological products, reducing the use of pesticides (Santos et al., 2021).
3. Smart irrigation: the use of soil moisture sensors and automated irrigation systems, which allow a more efficient use of water, reducing waste and costs (Pinto et al., 2014).
4. Vertical farming: the production of food in controlled environments, such as greenhouses and sheds, using technologies such as LED lighting and hydroponics (Dutra, 2019).
5. Agtechs: companies that develop technological solutions for agribusiness, such as management software, climate monitoring, and data analysis (Zanon et al., 2020). We mention the great success of **Agtech Garage in Piracicaba**, which is home to more than 1050 startups, 80 sponsoring partners. The incubator was acquired by PwC, reinforcing the need for Governance in innovation in Brazil (Agthec Garage, 2023).
6. Internet of Things (IoT): the use of sensors connected to the internet to collect real-time data on weather conditions, soil moisture, air quality, among others, allowing for more assertive and efficient decision-making (Shilu et al., 2018).
7. Robotics: the use of robots for tasks such as harvesting and spraying, reducing the need for labor and increasing efficiency (Ueta and Bortolli, 2020). We cite recent advances in spraying with drones.
8. Blockchain: it is the great value opportunity and traceability challenge of the same magnitude in Brazilian agribusiness. From blockchain, technologies that

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WhatsApp: +55-11-972671139. E-mail: caio@agro-valor.com.

generate new markets have emerged, such as smart contracts, distributed consensus, decentralized autonomous organizations, cryptocurrencies, digital identity, cryptocurrency mining, and asset tokenization (Torkya, 2020; Guoqing, 2019). Distributed ledger technology can trace the origin of food and ensure the transparency and security of the production chain (Souza and Fonseca, 2020). We mention Geographical Indication of Origin projects, such as Sou de Algodão (2016) and Queijos da Serra da Canastra.

9. Renewable energy: the use of clean energy sources, such as solar and wind, to reduce dependence on fossil fuels and reduce greenhouse gas emissions (Santos et al., 2020). We mention the Embraer EMB-195 E2 project, using 100% "Sustainable Aviation Fuel" (Garbuno, 2022). We also mention Raizen's 2nd Generation Ethanol plants, E2G, achieving extreme efficiency by reusing their own waste in the main production cycle.

10. Carbon-neutral agriculture: the adoption of agricultural practices that contribute to the reduction of greenhouse gas emissions (Santos and Gomes, 2020).

Digital technologies are solutions to agribusiness and socio-environmental challenges. On the Embrapa website (2021) several digital projects meet the 17 UN DDS. They are an integral part of the Schools, Universities and in Figure 11 we indicate those available in the Technological Park of São José dos Campos. The technologies will be able to generate the chain of information blocks in the interface links, identifying the products of Brazilian agribusiness, based on the right data, measured at the precise time, to compose the Agri-blockchain, which will ensure the inviolable connection of the best products with the recommended socio-environmental practices.

Between 2008 and 2013 we led a worldwide pilot project of Cocoa derivatives involving: 450 family farmers, research with ESALQ-USP for the classification of the derivatives, registration of the Cocoa Crop Plan with the Ministry of Agriculture [MAPA], registration of Geographical Indication [GI] for the Region of Linhares-ES, construction of the factory "Floresta do Rio Doce Agro derivatives of Cocoa", construction of the chocolate factory, sale to artisans via the network of distributors, retail and export to Europe, Asia and the Americas. In the pilot we identified several barriers that are being solved through technologies, not available 10 years ago, when it was decided to continue with projects of origin only in other countries. (Campo Vivo, 2010; Martins, 2010; INPI, 2012; Investe São Paulo, 2014).

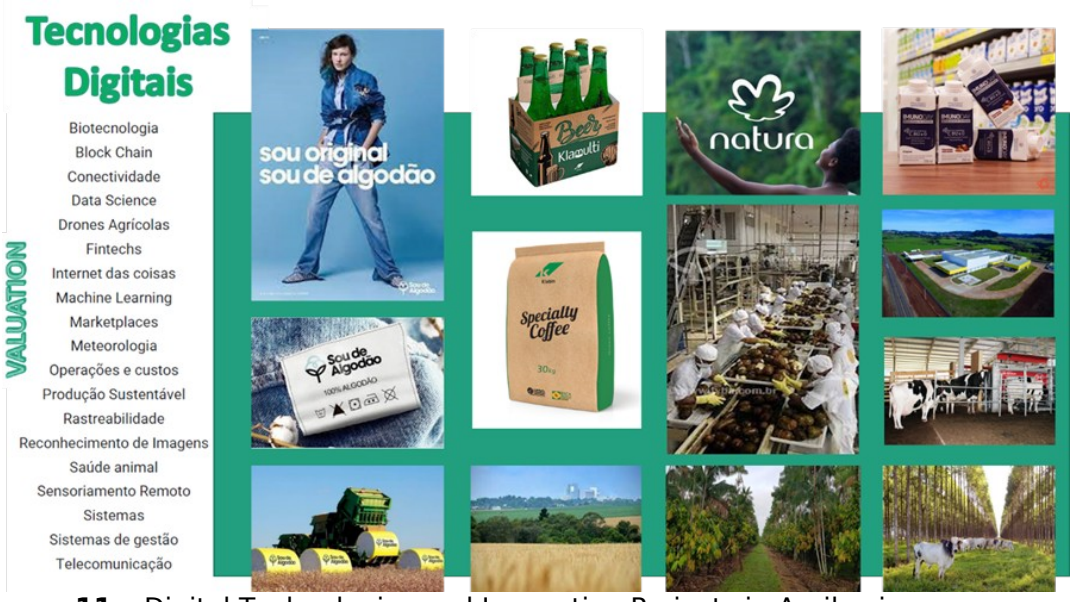

Figure 11 – Digital Technologies and Innovative Projects in Agribusiness. Source: AgroVale (2022)

3.8 The Matrix Valuation versus ESG Risk

Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
WhatsApp: +55-11-972671139. E-mail: caio@agro-valor.com.

Corporate Social Responsibility, generally focused on charitable actions and reducing exposure to legislative risks, needs to evolve towards an innovative solution that simultaneously contemplates socio-environmental value for stakeholders and financial value for shareholders, preferably proactively and not reactively to the disappearance of financial benefits (BNDES, 2023). Cutting-edge experts in business management indicate that this will be achieved through Corporate Social Innovation (Kyser, 2018).
We adapted Babson College's qualitative methodology, as shown in Figure 12, on Corporate Social Innovation, to be a quantitative comparison tool, based on business valuation values, located on the horizontal axis, versus the value in terms of ESG, estimated by (1-ESG Risk Assessment) on the vertical axis.
The application of this CSI Matrix to 20 leading companies in Brazilian and global agribusiness is shown in Figure 13, where we identify 4 quadrants:

Q1 (Low ESG Risk and Low Value), represents a comfortable situation for companies, which must progressively move to the right in obtaining value, due to their low risk and probably lower debt and better dividends.

Q2 (High ESG Risk and Low Value), represents the largest share of the market, with companies with a controversial reputation, stigmatized sectors, such as cattle ranching, and companies with financial difficulties. Here are the acquisition targets for buyers in the same segment located in Q3 and Q4.

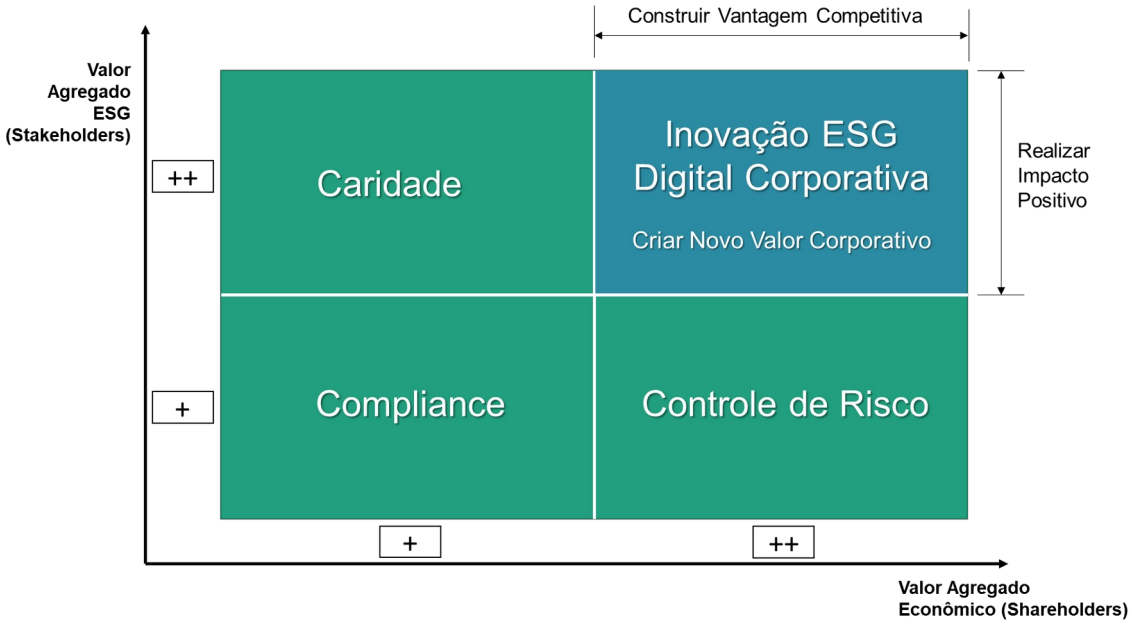

Figure 12 – Meaning of the CSI Matrix
Source: Babson College (2022)

Q3 (Low ESG Risk and High Value), this is the ideal quadrant, with low ESG risk and high financial value for investors. We put many companies there, world leaders such as Nestlé, Coca-Cola, L'Oreal, Givaudan, Lindt. Highlight for the Brazilian Klabin, which after publishing its December 2022 results had a considerable improvement in Valuation. Another highlight is M. Dias Branco, which is on its way to entering this quadrant.

Q4 (High ESG Risk and High Value), this should be a temporary or prohibited quadrant, as it indicates the presence of high-value companies with questionable ESG practices. Although we may find a few companies in this situation, they should progressively evolve to other quadrants due to the greater adoption of ESG Risk Assessment criteria.

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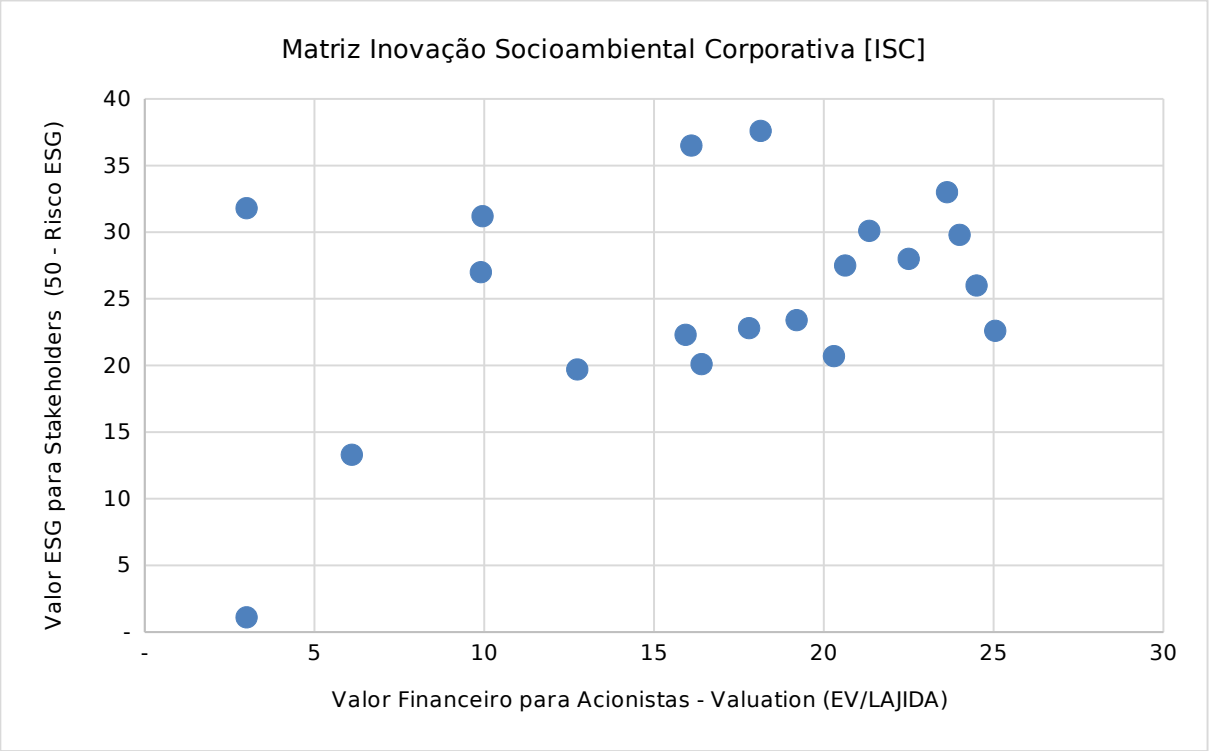

Figure 13 – CSI Matrix applied to Agribusiness.
Sources: Yahoo Finance; Sustainalytics

Based on the use of the CSI Matrix, we recommend that companies expand ESG and Digital Transformation projects to various internal links in the value chain, as shown in Figure 14.
ESG and Digital evolution must be evaluated in all links, ensuring that causes (investments) and effects (desired socio-environmental impact) are permeable to the business structure and market until they are perceived by stakeholders as planned.
In view of the communication challenges that agribusiness faces, this value planning in all internal pillars of the company is necessary and today it is a probable factor of business failure for carrying it out without the proper depth with so many stakeholders.
In Brazil, innovation is necessary in ESG, with emphasis on Corporate Social and Environmental Responsibility, in an accelerated process of judicialization.
We recommend that value chains be reviewed to incorporate projects with positive socio-environmental impact in both primary and secondary activities.
Here again, the high correlation between Digital and ESG is a great synergy lever to accelerate the desired transformations.
We draw attention to aspects that need to be (re)enhanced in the light of the connected world and include them in the value chain, such as Communication, Positive Social and Environmental Impact, Governance (purposely in HR), Technology Development (as a transversal secondary activity) and Service (of Customer Service) to Customers, Society and the Environment.

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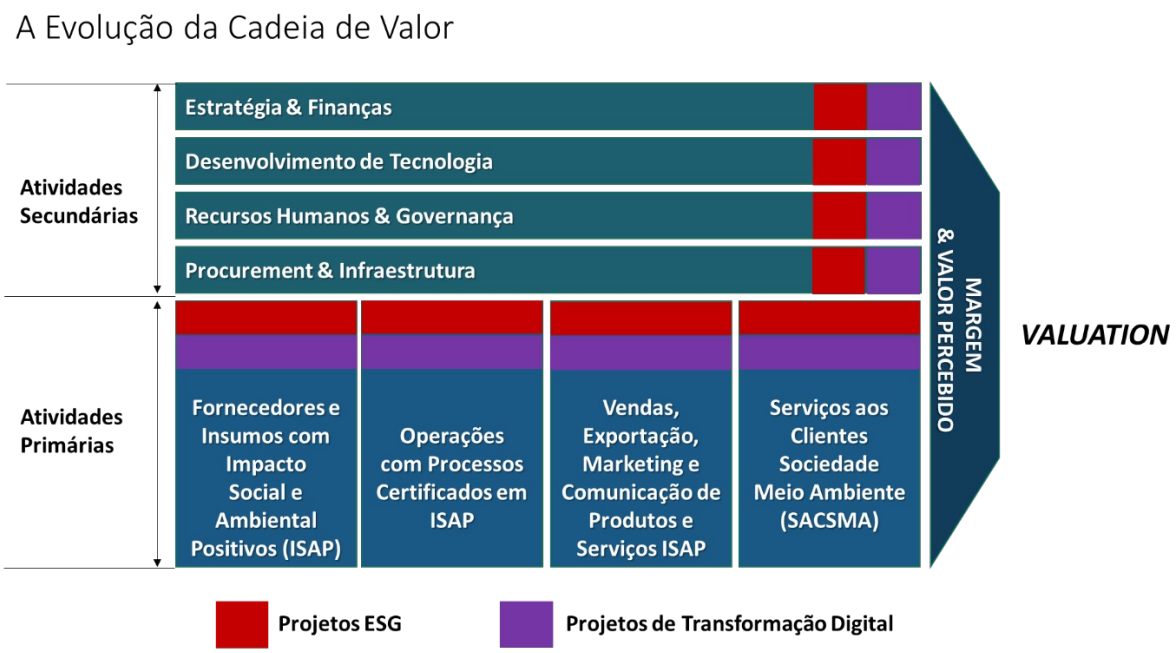
A Evolução da Cadeia de Valor
Atividades Secundárias
Estratégia & Finanças
Desenvolvimento de Tecnologia
Recursos Humanos & Governança
Procurement & Infraestrutura
Atividades Primárias
Fornecedores e Insumos com Impacto Social e Ambiental Positivos (ISAP)
Operações com Processos Certificados em ISAP
Vendas, Exportação, Marketing e Comunicação de Produtos e Serviços ISAP
Serviços aos Clientes Sociedade Meio Ambiente (SACSMA)
MARGEM & VALOR PERCEBIDO
VALUATION
Projetos ESG
Projetos de Transformação Digital

Figure 14 – ESG and Digital in the Value Chain (adapted from Porter, 2009)

3.9 The New Category of Value Industries

The systematic mapping indicated concepts that guided this work, with Sustainable Valuation (Moro-Visconti, 2022; Liao and Wang, 2021; Kurth, T. et al., 2021; De Felice, F., 2021; Vetsch, L. 2021). After healthy products, the evolution of value points to companies that contribute undeniably to sustainability and preservation. We have in Brazil a giant example of Sustainable Valuation.

Cosan was elected the Best Company in Brazil in 2022 by Exame (2022), with successive records after the IPO in [B][3]. In the last 5 years, the Revenue has multiplied by 2 and the market value by 13. This jump in the company's valuation, from R$3 billion to R$39, has as a secret the 2nd Generation Ethanol plants, producing 50% more alcohol with the same sugarcane planted area. In other words, an indicator 100% aligned with the global climate agenda, as Cosan will not need new plantations to generate renewable fuel growth. A strategy valued in international markets. In addition, E2G uses waste from the mills in its production process, alleviating the company's environmental footprint. Cosan invests R$2 billion in the construction of new E2G plants. The word that solves this and other agribusiness sectors is productivity, but it is the digital transformation that ensures that the materiality associated with Cosan's expansion is certified and recognized worldwide.

Thus, we exemplify the profile of new companies as those that contemplate added value (healthy, beneficial, natural) and positive socio-environmental impact proven and comprehensive by the digital lever.

Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
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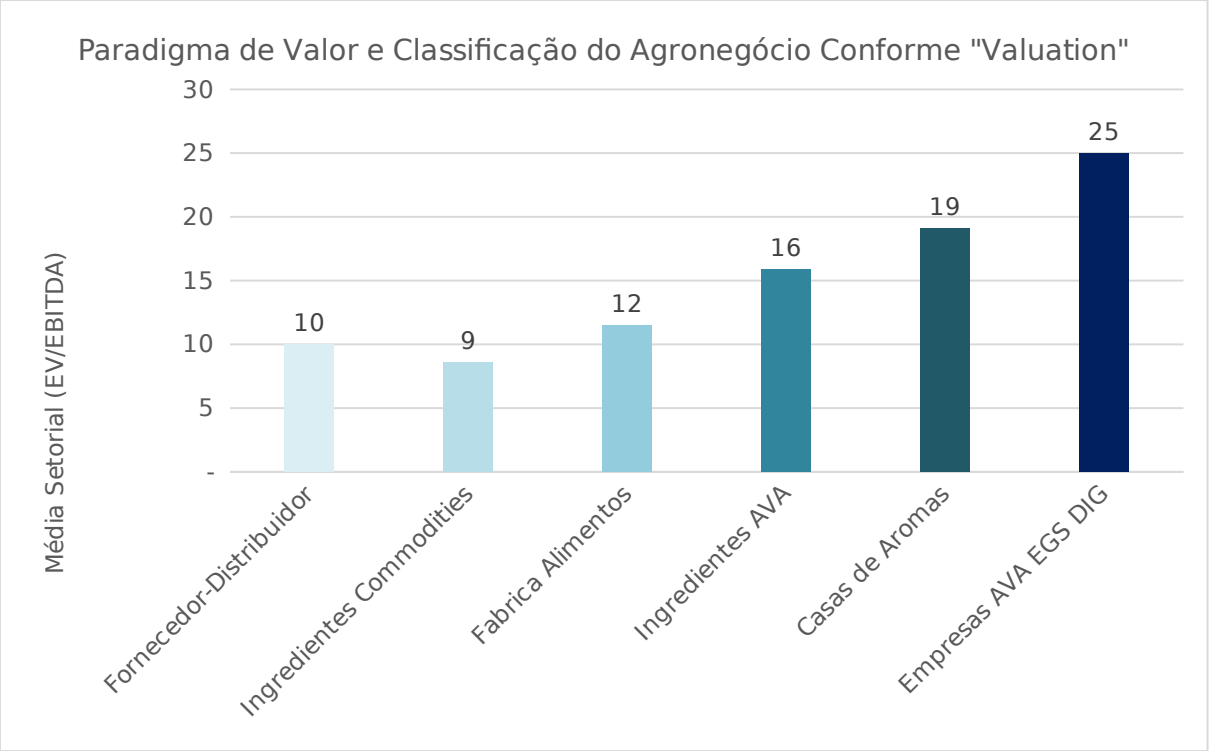

Figure 15 – The New Value Paradigm in Agribusiness. Source: Kroll (2022)

4. CONCLUSIONS

Brazil brings together quality companies and products, undervalued in international markets for historical reasons, disorderly development, deficient communication and lack of consensus in projects. Even so, there are examples of the intrinsic quality of agribusiness, as a value superior to international brands.

We carried out a broad systematic mapping of the correlation of the highest business valuation with good ESG practices accelerated with Digital. We found a great opportunity to build a new meaning for Brazilian agribusiness through the confirmation via digital technologies of the positive socio-environmental impact.

To contribute to the strategic evolution of industries in the links of the agribusiness chain, we exemplify the forms of comparative analysis through "Valuation" as a great generator of insights. We suggest the Corporate Socioenvironmental Innovation Matrix, ESG value *versus* Financial value, to guide the path of evolution of the agribusiness sectors.

We found that value-added ingredients outperformed the market (S&P500) by outperforming 20x EBITDA. Digital technologies will prove the positive socio-environmental impact, emerging a new class synonymous with Health-Well-Being-Origin-Sustainable, with a Valuation between 25 and 35x EBITDA, probably named **"AgriTech 6.0".**

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Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
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Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
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Corresponding author: H.C. Gouvea. Rua Cruzalea 115, CEP 13432-581. Piracicaba-SP-Brasil.
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